

Mixed Reality based Mission Management for the Next Generation Fighter

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The Future Battle Space

In the past years, multiple nations teamed up with the endeavour to research and develop the next generation of air combat systems. The most well-known programs are the „Future Combat Air System“ (FCAS) from Germany, France and Spain, the „Global Combat Air Programme“ (GCAP) from the United Kingdom, Italy and Japan, and the US-American „Next Generation Air Dominance“ (NGAD).

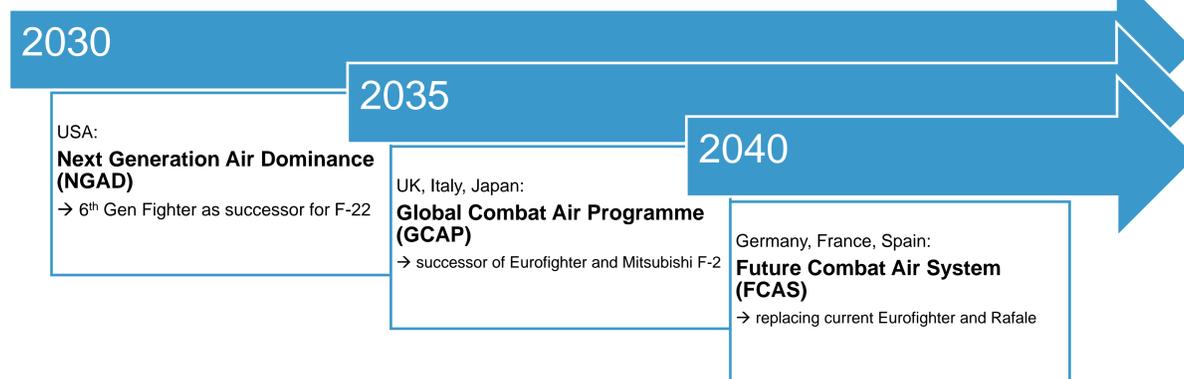


This challenge of supervisory control will be independent of the remote operator’s location: either onboard the fighter or in a ground control station. In either case, a tactical guidance (i.e., maneuvering the aircraft) will become less likely the more assets are under an operator’s control.

Mixed Reality Mission Management in the Next Generation Fighter Cockpit

As a fighter jet cockpit is very limited in space, the possibility to integrate additional displays (e.g. for mission management) is as well. Therefore, the poster’s author presents his idea of a continuum of mixed reality mission management user interfaces (cf. three figures below). This allows the pilot to monitor and command their UCAVs without being constrained by the window frame like conventional panel-mounted displays. Furthermore, the pilot is still able to see their real cockpit systems and the out-the-window view that are usually occluded in a fully virtual environment (most right figure below).

The visualization in the middle shows how mixed reality may exploit the content of the panel-mounted displays and can extend it beyond its boundaries. Additionally, it can extrude it: For example, a SAM dome that is projected down as a circle in 2D can be extruded by mixed reality and shown as a proper dome in 3D. The virtual kneeboard on the left side simply works as an additional display placed in the lap of the operator. This has the advantage that the conventional display is still visible and usable.



All these programs envision a system-of-systems approach for future air combat operations where the next generation fighter is supported by several manned and unmanned platforms. The latter is to be considered of particular importance (see images above) as they are envisaged in multiple sizes, each comprising varying capabilities to accomplish distinct tasks like reconnaissance, serving as decoy or to attack hostile forces. Integrating such unmanned combat aerial vehicles (UCAVs) into the future battlespace can be seen as a force multiplier for the unmanned platforms while mitigating the risk for further casualties.

The Human Role

While it remains yet unclear how automated those UCAVs will be and what the tasking of those will ultimately look like, one can imagine that managing a swarm of UCAVs will pose a major challenge on those responsible as they will likely not initially operate fully autonomous – in the sense of own decision-making and problem-solving. This may be due to technological immaturity, ethico-legal restrictions or just to keep the remote operator in the loop. Instead, they may require a form of task-based guidance by the operator.

Virtual Battlespace as Kneeboard



Extension and Augmentation of 2D display



Fully Virtual Battlespace Visualization



<https://design4real.de/en/what-is-this-metaverse-and-what-isnt-it/>

References

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